

Point Liquid and Polymer Strip Discriminating Sensors

Point liquid type sensors use solid state electronics, which measure a particular physical property or properties of liquid that contacts the detection element. An example is capacitance change sensors, where liquid contacting the detection element acts as the dielectric in a capacitor. Air (no liquid present at sensor), hydrocarbon-based liquids, and water each have distinctly different dielectric constants. A capacitance change sensor can detect this and respond differently when dry, or when exposed to water or hydrocarbons. Different responses from the sensor are interpreted by the control panel, which activates the appropriate alarm.

Point liquid discriminating sensors are capable of responding only to liquids directly in contact with the detection element. This means that product floating on water will produce a water alarm if only the water is in contact with the detection element. The detection elements are usually quite small, meaning that it does not take a great deal of water to potentially mask a product release. Point liquid discriminating sensors tend to be smaller than the polymer strip type, and contain no moving parts. These attributes allow them to be installed in a variety of orientations, and in tight spaces (such as a tank interstice) where polymer strip sensors would not fit. Response time for this type of sensor varies by manufacturer and model, but is generally quick (less than 1 minute).

In contrast to point liquid discriminating sensors, polymer strip sensors use two detection elements combined in one housing to discriminate between product and water*. The first detection element is a float switch or ultrasonic detector that will activate a “low liquid level” alarm when in contact with any liquid. It is located near the bottom of the sensor, and generally has a quick response time (less than 1 minute). The second detection element is a hydrocarbon-sensing cable or strip that will activate a “product” alarm when exposed to hydrocarbon-based product. It will not respond to water. The cable or strip typically runs from the bottom to the top of the sensor, and response times vary between approximately 5 minutes and 20 minutes in unleaded fuel (may be 12 hours or more in diesel fuel).

It is only by combining the float or ultrasonic liquid-sensing element with the hydrocarbon-sensing element (cable or strip) that the polymer strip type sensor is able to discriminate between product and water. A liquid entering the area monitored by the sensor will first contact the lowest float or ultrasonic detection element, activating a “low liquid level” alarm. This alarm alerts the UST operator that liquid is present in the monitored area. If the liquid present is gasoline, the hydrocarbon-sensing element will activate a “product” alarm approximately 5 to 20 minutes later (may be 12 hours or more for diesel fuel). In this event, the UST operator knows that product is present in the area monitored by the sensor, not just water.

Polymer strip discriminating sensors offer the benefit of being able to detect a layer of hydrocarbon floating on water, as long as the water level is in contact with the hydrocarbon-sensing strip. This makes them well suited for locations where water ingress is common. Many (but not all) of these sensors have an additional float or ultrasonic liquid-sensing element located at the top end of the hydrocarbon-sensing strip. This element activates a “high liquid level” alarm, which indicates that the liquid level has exceeded the height of the hydrocarbon-sensing strip. Once water has reached this level, subsequent product releases may float above and fail to contact the hydrocarbon-sensing strip, resulting in a missed detection. Polymer strip type sensors are less likely to miss a layer of product on water than point liquid discriminating sensors, but it is still a possibility that UST operators and inspectors should be aware of.

* Examples of polymer strip discriminating sensors include Emco Electronics models Q0003-002 and -003, Incon models TSP-DDS and TSP-DTS, and Veeder-Root models 794380-320, -322, -350, and -352).